The Status of Optical Communications at NASA/JPL

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Abstract

Future **NASA** and commercial space missions will require communications terminals to provides higher data rate with lower mass and power. Optical communications is a rapidly developing technology in response to this demand. Component and system technologies for both communications from Earth orbit and deep space is under development. This includes both ends of the link: the flight terminal and the ground receiver. Data-rates for Earth-orbit to ground or earth-orbit to earth orbit (e.g. LEO-to-GEO) are on the order of Gig-bits per second (Gbps). **A** 1-meter diameter ground receiver would be adequate at this range. The deep-space communication data-rates are on the order of **10's** of kbps to **100's** of kbps.

Large receiver diameters (ideally greater than 10 m) will be required for most deep-space missions. The ground receiver will be a non-imaging system to efficiently collect signal photons. Thus, surface quality could be inferior to those used for astronomy. However, surface quality has to be high enough quality such that the received beams may be focused to a small diameter detector (a few hundred microns to a few millimeters in active region depending on the pulse-width of the signal and requirements for ranging). NASA is currently building a 1-m R&D telescope laboratory at its Table Mountain Facility in southern California to answer key implementation questions of this technology. The telescope is designed with fast tracking capability and will act as a testbed for development of ground acquisition, tracking and communications strategies applicable to future operational stations. Establishment of requirements and analysis to predict the performance of large diameter "photon bucket" telescope is continuing. These and other programs currently under development are described below.